S052-009 Room: Convention B Time: May 28 16:00-16:15

Scaling law of small to moderate-sized earthquakes along the plate boundary east off northeastern Japan

Tetsuo Yamashita[1], # Tomomi Okada[2], Akira Hasegawa[2]

[1] RCPEV, Tohoku Univ, [2] RCPEV, Graduate School of Sci., Tohoku Univ.

Seismicity is very high along the plate boundary east off northeastern Japan. In this area, diversity of source characteristics of large interplate earthquakes is also large; tsunami earthquakes, slow slip events and ordinary events. We estimate the scaling relation, i.e. Mo (seismic moment) - fc (corner frequency) relation, of small to moderate-sized earthquakes in this region. We also estimate spatial variation of the scaling relation along the plate boundary of this subduction zone. Matsuzawa et al. (2002) and Igarashi et al. (2003) detected many repeating small earthquakes occurring along the plate boundary. Obtained scaling relation is compared with the scaling law proposed by Nadeau and Johnson (1998) for the repeating earthquakes in the San Andreas Fault.

To estimate fc from observed spectra of earthquake accurately, we used spectral ratio method (e.g. Aki, 1967). We calculate spectral ratios of all event pairs with the separation less than the hypocenter location error, and estimate fc values by fitting them with theoretical spectral ratio. Seismic moment was estimated from the JMA (Japan Meteorological Agency) magnitude. We used waveform data from the microearthquake observation network of RCPEV, Tohoku University. We obtained fc and Mo values for events that occurred from 1996 to 2001 with magnitudes from 3.0 to 6.0.

Obtained Mo-fc relation is somewhat scattered, and its range is within the modified scaling law of Nadeau and Johnson (1998) with various coupling (1 to 100%) as well as the scaling law with various stress drop (0.1 to 10Mpa). This scatter in Mo-fc relation is caused partly by its regional variation. Particularly, lower stress drops are estimated in the fault area of the 1896 Sanriku tsunami earthquake (Tanioka and Satake, 1996). Higher stress drops are obtained for the deeper portion (deep thrust zone) of the plate boundary. This tendency of higher stress drops for deeper events can be explained by the difference in physical properties (i.e., rigidity) which depend on depth. Mo-fc relation also varies along the arc. Areas with higher stress drops are distributed in and around the asperities of some large earthquakes.